

PAM
QU145
1992
G78M



Food Safety Directorate

**MAFF Food Research
Strategy and Requirements
Document 1993-95**

October 1992

Ministry of Agriculture, Fisheries and Food



22500070570

OCTOBER 1992

OCTOBER 1992

WELLCOME INSTITUTE LIBRARY	
Coll.	welMOMec
Call.	pam
No.	QU 145
	1992
	678m

Contents

	<u>Page</u>
FOREWORD : Dr W H Denner, Chief Scientist (Food)	1
PREFACE	3
1. MAFF AIMS FOR SUPPORT OF FOOD RESEARCH	5
2. POSITIONING OF MAFF SUPPORT FOR FOOD RESEARCH	7
3. ACHIEVING THE AIMS	9
3.1 MANAGEMENT OF COMMISSIONED RESEARCH	9
3.1.1 Content of Proposals	9
3.1.2 Selection Criteria	9
3.1.3 Monitoring Progress	10
3.2 COLLABORATION	12
3.3 OPEN CONTRACTING SCHEME	13
4. RESEARCH REQUIREMENTS	14
4.1 INTRODUCTION	14
4.2 RESEARCH PRIORITIES FOR 1993/1995	14
4.3 RESEARCH REQUIREMENTS	15
4.3.1 Food Quality & Nutrition - MINIM PP1:06	15
4.3.1.1 Nutrition	15
A. Strategic Research:	15
1. Longer Term Requirements	16
2. Dietary Fats	17
3. Antioxidant nutrients	18
4. Complex Carbohydrates in the Diet	19
B. Short Term R & D:	20
1. Dietary Surveys	20
2. Food Composition	21
4.3.1.2 Food Choice and Acceptability	21
4.3.1.3 Food Authenticity and Adulteration	23
B. Short Term R & D	23

4.3.2	Food Safety - MINIM PP1:07	24
4.3.2.1	Food Prosamo Programme	24
	A. Strategic Research	24
4.3.2.2	Risk Assessment, Management and Public Perception of Risk	26
	A. Strategic Research:	26
	1. Hazard Prioritisation	26
	2. Intakes Estimation	27
	3. Risk Management	28
4.3.2.3	Chemical Contaminants	30
	B. Short Term R & D:	30
	1. Inorganic and Organic Contaminants	31
	2. Pesticide and Veterinary Medicine Residues	32
	3. Contamination arising from the Use of Food Contact Materials	34
4.3.2.4	Natural Constituents of Food	36
	A. Strategic Research	36
	B. Short Term R & D:	38
	1. Surveillance for specific constituents	38
	2. Inherent Natural Toxicants	38
4.3.2.5	Additives in Food	39
	B. Short Term R & D	39
4.3.2.6	Pathogenic Micro-organisms	40
	A. Strategic Research:	41
	1. Conditions leading to Growth and Inhibition of Pathogens	41
	2. Separation and Concentration of Micro-organisms from Foods	41
	3. Hygienic Processing of Food	42
	4. Detection of Pathogenic Micro-organisms and their Toxins in Food	43

4.3.2.7 Improved Methods of Analysis - Food

Irradiation 43

B. Short Term R & D 43

4.3.3 Radiological Protection - MINIM PP1:08 44

4.3.3.1 Adventitious Releases 45

4.4 MAFF SUPPORT FOR INNOVATION - MINIM CE2:10 48

4.4.1 Achieving the Aims 49

4.4.2 LINK INITIATIVES 49

4.4.2.1 Food Processing Scheme 50

4.4.2.2 Agro-Food Quality 51

4.4.3 New Programmes 53

4.4.3.1 Hygienic Food Processing 53

4.4.3.2 Rapid and Versatile Processing 54

4.4.3.3 Innovative Food Packaging Technologies 55

4.4.4 Technology Transfer 56

4.4.4.1 Support for Training 56

4.4.5 EUREKA 57

TABLE 1: List of current programmes, review dates & managers

- APPENDICES
- 1) Example of the application form for the MAFF Open Contracting Scheme
 - 2) Definition of Genetically Manipulated Organism (GMO)

Appendices 3-8) Selected Research Programme outlines:

- 3) Antioxidants in Foods
- 4) Rapid Methods for the detection of Food Pathogens
- 5) Role of Complex Carbohydrates in Nutritional Health
- 6) LINK programme in Food Processing Sciences
- 7) LINK programme in Agro-Food Quality
- 8) The EUREKA programme

FOREWORD

This present revision of the Research Strategy and Requirements for the Food Group of the Ministry continues our commitment to ensure that potential contractors are continuously informed of our priorities and the reasons behind them.

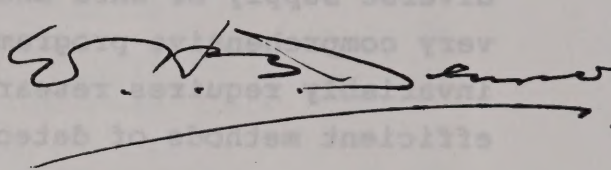
The Ministry is an important source of funding for strategic research work on all aspects of the efficient production of a diverse supply of safe and nutritious food. It also operates a very comprehensive programme of food surveillance which invariably requires research into the development of new, more efficient methods of detection.

The scientific issues, which need to be effectively addressed to understand how components of our food supply interact and contribute to the overall quality and safety of the diet, are complex. These issues cannot be uniquely addressed by the resources available to this Ministry. Other Government Departments, Research Councils and industry have a role to play. For this reason it has been considered necessary to clarify where the boundaries of the Ministry's support will be drawn, and further refine our research needs.

We have also taken this opportunity to bring in new policy thrusts. The most important of these has been the recent publication of the Government's White Paper "The Health of the Nation". For the first time specific targets have been set which, if they are met, will have a major impact on the nature of the food supply and on the fat composition of the diet in particular. To respond to these issues, a major expansion of a programme on dietary lipids and the effects on cell function is proposed.

Another feature of this revised document is our attempt to ensure that a critical mass of resources will be available in order that a programme of research can meet its objectives within a reasonable time-scale. For this reason a number of programmes, particularly in the area of nutrition, are inter-related.

I hope this document proves helpful to potential contractors. I would be very happy to receive suggestions on how this document might be further improved.



DR. W.H.B. DENNER
CHIEF SCIENTIST (FOOD)

PREFACE

In 1991 the Ministry of Agriculture, Fisheries and Food (MAFF) published a Strategy and Requirements Document 1992/94 which set down the research requirements which it anticipated were necessary to provide a sound basis for advice to Ministers, and to ensure that the departmental aims were achieved.

The document was produced as an essential part of MAFF's role as an intelligent customer for R & D. It ensured that a wide cross section of the scientific community would become more informed of the principal requirements of the Ministry, which in turn would enable them to target research proposals on emerging policy needs.

The reaction to the document was that it was a valuable exercise and of considerable help to our present and potential contractors. Nonetheless, the overall view was that the document would be even more valuable if it was much more specific in defining the immediate priorities for research. This view has been taken into account in producing this further document.

Out of a total current MAFF expenditure on external R & D of £17.37M, about a fifth is expected to be available for re-investment in 1993/94. For the following financial year it is estimated that a further 7% will be available for re-investment.

The last Strategy and Requirements Document did not attempt to separate the short and more long-term strategic needs of the Department. There are a plethora of short-term research needs which are required for surveillance, and the immediate implementation of the policy needs of the Ministry. The present document has been revised to clearly identify where the longer term research needs of the policy divisions are focused, and the reasoning behind the choice of these areas. It is hoped that

this will give potential contractors a better focus for making longer-term investment decisions in the provision of an appropriate skill base. The list of topics indicated in the document is not however anything more than a general indication of the research needed. Any contractor who feels able to propose a line of research which will provide imaginative new approaches to some of the general issues raised, is encouraged to submit proposals.

Details of presently commissioned programmes can be obtained from the Chief Scientists' Group. It is hoped to produce a series of newsletters on the developments in individual programmes as and when they occur. These will be widely disseminated. Also, as resources allow, workshops will be held to discuss the results and implications of particular programmes.

Proposals for the commissioning of research in 1993/94 and 1994/95 will have to be submitted to the Chief Scientists' Group no later than 15 January 1993. Any proposals received after that date will only be considered for funding under exceptional circumstances. However, potential contractors are encouraged to discuss any proposals with the Chief Scientists' Group at any time and its advice sought.

The principal contact point for the submission of proposals for research is:

Scientific Liaison Officer (Food)
Chief Scientists' Group, Food Safety Directorate
Ministry of Agriculture, Fisheries and Food
17 Smith Square, London, SW1P 3JR

Tel: 071 238 5996/5536

Fax: 071 238 5597

1. MAFF AIMS FOR SUPPORT OF FOOD RESEARCH

The aim of the MAFF Food R & D Programme is to provide an appropriate skills base and information which will enable Policy Divisions to achieve three principal aims. These mutually inter-dependent aims are:

1. to ensure that any risk to health arising from the consumption of food is kept as low as practicable;
2. to provide consumers with the information necessary to choose a healthy and nutritious diet; and
3. to encourage a competitive food industry through improved awareness of, and increased investment in, R & D.

MAFF through its Food Safety Directorate has the responsibility to protect the public by promoting food safety. It also has the responsibility to provide the framework of consumer protection for other issues involved in the supply of food, notably that food should be as it is described. This consumer protection activity requires scientific information on methods of analysis which will establish food composition and adulteration.

The research commissioned by MAFF provides the major input into the scientific basis for consumer protection, the elaboration of a national food policy, and its effective implementation through statutory or non-statutory controls.

Food safety is maintained by an extensive range of legislative and administrative provisions that depend on the production of relevant information through research, advice, legislation, monitoring and enforcement. To a great extent, these policy developments are driven by advances in food technology.

Scientific research and monitoring identify new problems and new opportunities for improvements in legislative controls, as well as providing the basis for advice and guidance to both consumers and industry. In many cases the results are provided to independent expert advisory committees in both MAFF and other Departments so that Ministers have the benefit of advice from a wide range of scientific experts.

Particular research requirements frequently emerge as a result of the issues addressed by these expert committees. In addition, MAFF plays a major role in participating in international meetings concerned with facilitating the free movement of foodstuffs throughout the European Community and internationally.

Surveillance and research form an essential requirement for full and effective negotiation in all areas of food safety to ensure that food imported and exported from the UK meet acceptable standards, both to the UK industry and its consumers, as well as our major markets overseas.

The specific aims are:

- i. to promote food safety with respect to pathogenic micro-organisms in food;
- ii. to promote food safety with respect to adventitious chemicals and their residues in food;
- iii. to assess the nutrient content of the food supply, consumer intakes of nutrients, and the significance of these intakes;
- iv. to provide ways and means of establishing the authenticity of foods and thus preventing adulteration;

- v. to provide scientific and technical advice to expert Committees in MAFF and other Departments and to Ministers on the use of chemicals in food and on the presence of chemicals and pathogenic micro-organisms in food arising from adventitious or accidental causes;
- vi. to advise on the likely exposure of the UK population, including critical groups, to food chemicals and to propose how risk management for food chemicals can best be carried out; and
- vii. to maintain a body of scientific expertise and back-up information to respond to food safety issues and in particular to enable appropriate responses to be made to new identified hazards in the food chain, including those arising from emergencies.

2. POSITIONING OF MAFF SUPPORT FOR R & D

MAFF is not the only UK agency funding food research. The Agriculture and Food Research Council (AFRC) is responsible for supporting the science base which underpins the more strategic goals of MAFF. The Department of Health (DH) is a major source of funding for work on the epidemiology and control of food borne microbiological hazards. Other sponsors of food research include the Medical Research Council (MRC) which supports basic scientific work on health-related issues. The Economic and Social Research Council (ESRC) has recently started an initiative on The Nation's Diet. The Scottish Office, Agriculture and Fisheries Department (SOAFD) and the Department of Agriculture for Northern Ireland (DANI) also support basic and applied research of relevance to the food sector.

MAFF on its own cannot meet the large investment which would be required in R & D, if all of the aims of the Department were to be fulfilled. Programmes of research need to be enacted in

collaboration with both national and international bodies. As a single market approaches, more and more of the policy issues which will arise will be issues emanating from the European Community (EC) and which will require a concerted European effort.

The European Community, through the activities of the Framework Programmes on R & D, is playing an increasing role in funding areas of relevance to MAFF's policy responsibilities. It is clear that MAFF's research priorities will have to reflect the activities already underway within Europe or which are planned.

Although it is not possible to draw a firm boundary in the area of food safety between work which is appropriate for one Government agency or another, MAFF's policy responsibilities clearly lie towards the protection of the food supply and the minimisation of risks to the consumer. The essential framework for gaining support for research from MAFF is that the work is:

- clearly related to a defined policy need;
- focused on factors in the diet which will ensure the maintenance of health rather than the control or understanding of disease (which is a DH responsibility);
- to provide data which establishes confidence amongst consumers in the safety and proper description of the food supply;
- not clinically focused or concerned with epidemiology. These areas are primarily for Health Departments to support.

MAFF will however seek to develop joint initiatives with other sponsors of R & D to ensure that food safety issues are cohesive and all relevant aspects of the problem are addressed.

3. ACHIEVING THE AIMS

3.1 MANAGEMENT OF COMMISSIONED RESEARCH

3.1.1 Content of proposals

Annex 1 provides an example of the application forms which all potential contractors are required to complete before a contract will be issued. These forms, together with explanatory notes, can be obtained from the Chief Scientists' Group. Outline proposals will be considered. This approach is often of value to contractors who may be in doubt about whether their proposals reflect MAFF's priorities, or whether similar areas of work are already being supported. All outline proposals should, however, provide sufficient information on the objectives, approaches to be adopted, and approximate cost for an informed opinion to be given.

An important feature of the application form is the need for contractors to specify in detail the key measures of achievement and milestones against which progress can be monitored. These milestones may need to be altered once the project is underway following discussions with the Programme Manager/Project Officer (see below).

3.1.2 Selection criteria

All proposals for research support are critically evaluated by the Chief Scientists' Group and policy customers for the following criteria:

- relevance to the policy customer's requirements;
- overall scientific quality and value-for-money (in conjunction with external referees where necessary);

- whether the approach proposed is the most feasible;
- likelihood of achieving the stated objectives within the proposed timeframe;
- research not already supported elsewhere.

In addition, for much of the work in food safety and applied nutrition, it will be important to demonstrate that there is collaboration between scientists covering the multi-disciplinary skills which are frequently necessary to achieve effective advances. This collaboration often crosses the traditional boundaries of Research Councils and University Departments.

Contractors will be informed of the reasons why a proposal could not be supported but it must be appreciated that limited resources preclude any detailed discussion on the reasons for rejection.

3.1.3 Monitoring of Progress

All research commissioned by MAFF is monitored according to the milestones and key measures of achievement laid down in the Contract. For the longer-term strategic research programme, MAFF appoints Programme Managers who are responsible for managing specific research programmes. In particular they:

- encourage co-operation and interchange of ideas amongst the contractors contributing to the programme;
- inform relevant policy discussion within MAFF;
- hold regular seminars between contractors, MAFF officials and management Committees where appropriate;
- regularly monitor progress by individual contractors

and undertake mid-term reviews of the achievements of the programme overall.

For the shorter-term research MAFF appoints Project Officers. Contractors are required to provide, in advance of discussions with the Project Officer, a 6-monthly report on progress and this is reviewed with the Project Officer. At the same time the future work programme is agreed for the following 6 months work. Any alterations to the objectives and agreed approaches in meeting these objectives are also discussed and agreed.

The individual programmes where Programme Managers have been appointed are listed in Table 1. Any individual who requires further information about these programmes is asked to contact the Programme Managers. Further Managers will be appointed in 1992 to cover the entire range of programmes.

Programmes will normally be subject to a mid-term review. The mechanism for these reviews is being slowly built up and during the period covered by this document detailed reviews of some programmes will be undertaken and subsequently the requirements for work within those programmes may be modified. During 1993-94 the following programmes will be reviewed: Food Structure in support of Nutritional Goals, Risk Assessment, Food Irradiation, Detection of Pathogens and their Toxins, The Physico-chemical Principles underlying Microbial Growth in Heterogeneous Foods, Response to Emergencies and the LINK programme - Agro-Food Quality. In the next year, 1994-95 the programmes: Antioxidants in Food, Food Authenticity and Adulteration, Food Chemical Safety, Improved Enforcement Methods of Food Analysis, Detection of Pathogens and their Toxins, and Assessment of Effects of Radioactive Discharge will be reviewed.

All of MAFF's strategic research programmes will be subject to a detailed review by independent peer review groups selected from academia and industry. It will be the responsibility of these review groups to comment on the quality of the scientific output of the individuals contributing to the programme.

3.2 COLLABORATION

The Ministry is increasingly anxious to achieve its policy aims more effectively through collaboration with scientific teams working in related areas in other countries. This is particularly so for new areas of investment. The area of food safety and applied nutrition research should advance more rapidly through collaborative efforts than through national effort alone and is likely to have more of an impact on the development of agreed norms and standards for food safety and quality than national efforts in isolation. The investment of European industries in UK R & D programmes focusing on stimulating industrial innovation could enhance the competitiveness of our own agri-food industries and participation in EUREKA (see paragraph. 4.4.5) is a mechanism to achieve this.

As a result of the EC Framework Programme of R & D, opportunities exist for collaborative research support on a European basis. The Community's Third Framework Programme for R & D provides specific opportunities relevant to MAFF's aims in the specific programme lines on Agriculture and Agro-Industrial Research (AAIR) and Biotechnology. Although there are few opportunities to participate in these programmes at this stage, discussions are already beginning on planned activities under a Fourth Framework Programme which should overlap with the present programme.

In addition it is MAFF policy to increasingly interact with other funding bodies in the UK to set up joint programmes of research. Mechanisms already exist for the co-ordination of research between MAFF and DH and these will be strengthened. MAFF participates in the AFRC/MRC Nutrition Research Forum which is responsible for identifying new scientific opportunities in nutrition research and links with the Cancer Research Campaign are planned.

3.3 OPEN CONTRACTING SCHEME

Each year MAFF identifies strategic research needs which could benefit from drawing on a wider range of contractors than those normally used, both in order to ensure that competitive tendering procedures are widened, and that skills not presently available from our principal contractors can be identified. For 1993/95 the Open Contracting Scheme will seek to support work in the following areas:

- role of individual fatty acids in modifying cell membrane structure and function via changes in membrane fluidity or eicosanoid production;
- mechanism of action of dietary antioxidants in the prevention of free radical mediated damage to membranes, DNA or proteins;
- improved methods for estimating the dietary intake of food components (including the use of appropriate biomarkers).

Advertisements for proposals will appear in the relevant scientific press. The closing date for receipt of submissions for funding from April 1993 will be 15 January 1993.

Submissions should be made on standard application forms. These forms, together with explanatory notes, can be obtained from: Dr. John Stanley, Chief Scientist's Group (Food), Ministry of Agriculture, Fisheries and Food, 17 Smith Square, London SW1P 3JR; tel. 071-238-5544/5536, Fax 071-238-5597.

It is emphasised that the Chief Scientists' Group will consider applications for support from any contractor for all other priority areas identified in sections which have not been specifically ear-marked for promotion under this year's Open Contracting Scheme.

4. RESEARCH REQUIREMENTS

4.1 INTRODUCTION

Every year the policy divisions within the Ministry who are budget holders for the R & D programmes prepare a strategy which defines the priority issues which they require R & D to address. These strategies are presented to the R & D Committee of the Ministry's Management Board for approval who also approve the resources required to implement new programmes. Following agreement on the strategy, the Chief Scientists' Group (CSG) of MAFF is responsible, in consultation with the policy divisions, for defining the research requirements needed to implement the strategy. Each year contractors are informed of the new research needs and invited to submit research proposals for appraisal by the Chief Scientists' Group.

4.2 RESEARCH PRIORITIES FOR 1993/95

The previous document in this series (MAFF Food Research Strategy Requirements 1992-94) gave an overall view of the research needs of policy customers and some of the specific criteria that are sought from contractors. As indicated in the Preface, only a small proportion of our resources is available for reinvestment in 1993.

Consequently the Chief Scientists', Group has selected from this extensive list a more limited set of research priorities for support in the period 1993-95 on which proposals are sought. The document is divided into two main sections. The first section defines the principal requirements of the Food Safety Directorate and is divided into the MINIM (Ministerial Information in MAFF) topics PP1:06, PP1:07 and PP1:08 which correspond to the Ministry's major management and planning areas within the

Directorate. Each of these topics is further sub-divided into whether the requirement is for support for the longer-term strategic research programme, or is for short-term and very specifically-focused R & D in support of the Ministry's surveillance activities.

The second section outlines the principal activities of the Agriculture Commodities' Trade and Food Production Directorate which has the responsibility for promoting the competitiveness of the UK food sector. This management and planning area falls under a single MINIM topic MINIM CE2:10.

Within each MINIM research topic there are separately managed programmes. These are indicated in Table 1, together with the presently agreed dates for mid-term reviews of individual programmes, and the respective Programme Managers where these have been appointed.

4.3 RESEARCH REQUIREMENTS

4.3.1 FOOD QUALITY AND NUTRITION - MINIM TOPIC PP1:06

4.3.1.1 NUTRITION

A. STRATEGIC RESEARCH

Although the Ministry has always been concerned with the role of diet in relation to health, two separate (but linked) recent Government initiatives have reinforced the foundations of the Ministry's nutrition research programme. The first is the Department of Health's Committee on Medical Aspects of Food Policy (COMA) which set new dietary reference values (DRVs) for the UK population (Dietary Reference Values for Food and Nutrients for the United Kingdom, DH 1991) but gave clear indications where present scientific

knowledge was insufficient to set DRVs with great confidence. The second is the Government's White Paper, *The Health of the Nation*, which recognises that the nation's eating and drinking habits make a contribution to many aspects of health and ill-health. In order to reduce the prevalence of premature death and ill-health due to vascular disease, the White Paper sets two diet and nutrition targets. These are to reduce the percentage of food energy derived from total fat by at least 12% (from about 40% in 1990 to no more than 35% by 2005), and from saturated fat by at least 35% (from 17% in 1990 to no more than 11% by 2005). One implication of this advice is that the contribution of other nutrients, in particular complex carbohydrates, will have to increase. Two other targets with nutritional implications were set. Reducing the prevalence of obesity has implications for energy intake. Reducing the prevalence of hypertension has implications for sodium and potassium intake.

In order to better understand the implications of these targets for the food chain and to refine the hypotheses for the links between nutrient intake and health, the Ministry has identified the following long-term research requirements.

1. Longer Term Requirements

The Ministry wishes to encourage a fresh approach to human nutrition research. This approach will have a number of features:

- all the Ministry's research programmes in nutrition aim to better understand and improve upon what constitutes an ideal diet. It is therefore essential that research projects generate information concerning the levels of

nutrients and the balance between different nutrients needed to maintain health;

- the Ministry wishes to encourage a multidisciplinary approach to the solution of nutritional problems. It is felt that progress will be favoured by a combination of molecular, cellular and whole body approaches. It is hoped that this will lead to collaborations between very different disciplines and areas of expertise;
- it is essential that the Ministry's projects address human nutrition issues. It is anticipated, therefore, that some projects will need to develop the techniques needed to achieve this, e.g. non-invasive methods to study human metabolism, novel human cell culture systems;
- the Ministry has focused and integrated its nutrition research objectives. The programme on dietary fats has been given the highest scientific priority and the greatest resources. It will interact with the existing programmes on micronutrients and antioxidant nutrients.

2. Dietary Fats

Changes in fat intake have implications for the function of the whole body and not just the cardiovascular system. Proposals are invited which examine effects of individual fatty acids not only on the cardiovascular system but also on other systems. Effects of dietary fatty acids are mediated via changes in membrane fatty acid composition and it is therefore anticipated that cell and membrane biologists will have a major role to play in this programme. Particular areas of interest are:

- effects of and mechanism of action of individual saturated, monounsaturated, polyunsaturated and trans fatty acids on thrombosis and atherosclerosis;
- effects of dietary fats on the production of pro- and anti-inflammatory molecules by the cells of the immune system;
- role of dietary fats in tumour transformation, initiation, and promotion;
- role of dietary fats in modifying cell membrane structure and cellular function via changes in membrane fluidity or eicosanoid production;
- the factors which regulate the digestibility of different dietary fats in vivo in man.

3. Antioxidant Nutrients

Damage to key molecules impairs cellular function and may be at the origin of several diseases. Oxygen radicals are believed to be one, if not the major source of this damage, although they also play positive roles such as the killing of some strains of pathogenic bacteria by phagocytic cells. Nutrients can retard or promote oxygen radical mediated damage in vitro. However, more information is needed about their significance in vivo and levels in the diet which are effective. Molecular, cellular and whole body approaches will have a role to play in this programme. Particular areas of interest are:

- role of antioxidant nutrients in the prevention of free radical mediated damage to membranes, DNA or proteins;
- the relationship of free radical mediated damage to altered cellular function;
- the role of metal ions (Fe, Cu and Se) as pro- and antioxidants in vivo.

4. Complex Carbohydrates in the Diet

One way of decreasing total and saturated fat intake is to increase complex carbohydrate intake. It is unclear whether, at levels of intake acceptable to the British population, complex carbohydrates have effects beneficial to health independent of their role in lowering dietary fat intakes. Whole body approaches will be needed in this programme. There are two main areas of interest:

- effects of complex carbohydrates on the composition of large bowel microflora and the production of different end products of metabolism, eg. butyrate which have effects on the epithelial cells;
- the capacity of complex carbohydrates to inactivate genotoxins in the large bowel;
- the effects of botanical origin, cooking and processing on the pattern of assimilation of glucose from different dietary starches in vivo in man.

B. SHORT TERM R & D

In order for the Government to adopt policies which will enable the United Kingdom to make progress towards the targets set out in Health of the Nation and in the COMA report, it must know what people eat and drink, and what nutrients these foods contain. This information is collected by dietary surveys and food composition studies.

1. Dietary surveys

Dietary surveys are required on a continuing basis on nationally representative samples to determine long term trends in food consumption. These surveys take the form of the National Food Survey, which studies food purchases by households, and by the National Diet and Nutrition Survey which is carried out at intervals on different age groups to provide more detailed "benchmarks" on the actual diets of individuals. Only surveys which examine the diets of individuals (such as the National Diet and Nutrition Survey) are able to provide data on the proportion of the population which meets dietary targets. The National Diet and Nutrition Survey also includes health measurements to improve the Government's database on the relationship between diet and health. In addition to these large nationally representative surveys, individual surveys are required from time to time on specific sub-populations who may be identified as being at risk.

Research proposals on the methodology of surveillance are invited in the following areas:

- improved measurement of intakes of food using biomonitoring and of the consumption, balance and utilisation of nutrients;
- more economical and reliable methods of analysis for nutrients in foods.

2. Food composition

MAFF has for many years been responsible for producing the standard UK Food Composition Tables known as McCance & Widdowson's "The Composition of Foods". It is MAFF's policy to revise the tables on a cyclical basis to ensure that they include new foods, that they reflect changes in agricultural practice (such as new breeds of animals, and new husbandry and butchering techniques), fortification practices, packaging, domestic cooking and preparation practices.

Potential contractors for this analytical work are invited to contact the Ministry, listing their particular areas of analytical competence.

4.3.1.2 FOOD CHOICE AND ACCEPTABILITY

Sensory and physiological reactions, as well as psychological responses, affect consumers' food habits. Quantifying the strength of these responses will help to identify the emphasis to be built into policy formulation in order to influence food habits and choices and the information that consumers need in order to exercise choice. What motivates consumers to buy particular foods and how to quantify the strength of perceptions or the impact of perception upon behaviour are additional areas where little information is available.

New projects designed to understand the strength of certain factors affecting consumer choice are underway. These cover the areas of:

- i) understanding the barriers to the adoption and maintenance of reduced fat diets;

- ii) the development of methodology to measure the extent of consumer use of labelling information;
- iii) consumer perceptions of the acceptability of biotechnology;
- iv) the influence of label health and nutrition claims on consumer choice;
- v) the influence of advertising on dietary choice by children and young adults.

At the present time, resources do not permit new projects of any significance to be commissioned. Some current projects will, however, end in 1993/94 and thus resources may be available in 1994/95. When resources do become available there a number of areas that should be covered. In order of priority these are:

- consumer attitudes to choice of "health foods" and dietary supplements and how those attitudes may be influenced;
- the influence of presentation on consumer use of labelling information;
- the role of fat and other food components in satiety (it may be appropriate to link this latter project with the programmes covering nutrition).

Proposals are invited on these aspects of the psychological and physiological aspects of food choice.

4.3.1.3. FOOD AUTHENTICITY AND ADULTERATION

B. SHORT TERM R & D

Food fraud, the passing off of one food as another, prejudices the interests of both consumers and honest traders. It can take many forms, and there is a general need for methods to detect ingredients inconsistent with the labelling of the food. It is important therefore, to ensure that both Government and enforcement authorities have ways and means of ensuring that labelling is correct, and that declared ingredients are what they claim to be and are present in the amounts declared.

In order to achieve these aims, research is required to:

- develop methods to establish varietal and geographical origin (e.g. rice, wines, honey);
- develop methods to establish authenticity and adulteration (e.g. edible oils, fruit juices);
- develop methods to establish the plant origin of sugars;
- enable ingredients to be defined accurately (e.g. meat and fish composition, species, the mechanical recovery of meat and the presence of non-meat components);
- ensure the proper labelling of processes to which ingredients have been subjected.

4.3.2 FOOD SAFETY - MINIM TOPIC PP1:07

4.3.2.1 FOOD PROSAMO PROGRAMME

A. STRATEGIC RESEARCH

The strategic aim of this proposed new programme is to facilitate the safe use in food of genetically modified organisms (GMOs) and products thereof through the development of research strategies and a tool-kit of experimental approaches which will provide the basis on which industry, consumers and regulators can reach objective decision on safety.

GMOs are organisms in which the genetic material has been altered in a way that does not occur naturally by mating and/or natural recombination. It is now possible for genetically modified plants, animals or micro-organisms to be used as foods.

The programme is conceived at the outset as a collaborative venture between MAFF, the AFRC and the DTI and will directly involve the industrial sector whose contribution to the programme is a pre-requisite. The programme will not cover those areas which need to be addressed by individual companies wishing to market a specific product. Rather the emphasis is on generic issues which need to be addressed to reassure consumers and regulators that the technology is of low risk. Once the programme is underway it is hoped to extend the initiative on a European-wide basis by seeking EC support.

The programme has not yet been clearly defined but it is expected that the following core research activities will be undertaken:

- the development of alternative markers to antibiotic resistance for use in GM procedures and for the identification purposes, in order to eliminate the use of antibiotic resistance markers from strains of organisms used in food production and processing;
- an examination of the factors affecting genetic transfer to human gut microflora and gut epithelial cells from viable and non-viable GMOs consumed as food;
- the development of general procedures for detecting and monitoring the use of GMOs in food products;
- the parameters which affect the site of gene insertion during a GM procedure, (including biological methods such as bacterial or viral vectors and mechanical methods such as biolistics), as a means of ensuring site-specific insertions;
- development of a greater understanding of the factors affecting chromosome and plasmid stability and the use of this knowledge to improve the stability of GMOs used for food production;
- investigation of the efficiency of conventional food processing techniques in inactivating novel DNA and its transcription products;
- investigation of the fate, and consumer safety implications, of pesticidal residues (eg Bacillus thuringiensis toxin, pea lectins and viral coat proteins) produced in crop plants following insertion of novel genes.

4.3.2.2 RISK ASSESSMENT, MANAGEMENT AND PUBLIC PERCEPTION OF RISK (see also section 4.3.1.2)

A. STRATEGIC RESEARCH

Risk assessment and management are a joint responsibility of the Department of Health and MAFF with the former providing advice on the evaluation of health hazards and MAFF determining how best to control risks associated with the food supply. Risk assessment is a mechanism for identifying and evaluating potential hazards and likely exposures in a systematic and rational manner in order that optimal risk management strategies can be adopted. It is essential that the risk assessment should be as accurate as possible because any error will result in a cost to the consumer - either from an unacceptable increase in the risk of ill health or from an unnecessary increase in the price, and decline in the variety, of foods available. Research on improving methods of risk assessment is the responsibility of the Department of Health.

Risk management involves the evaluation of all available information, including scientific, technical and economic data in order to identify the best policy option. Whatever solution is arrived at should also take into account the public's perceptions of the risks in order that the policy can be understood and accepted.

1. Hazard prioritisation

The evaluation of novel foods and natural constituents of the diet, e.g. flavouring and colouring substances, natural toxicants, non-nutritive substances in food,

"health" foods and infusions etc, is often made difficult by the lack of toxicological data on which to base decisions. In order that substances can be prioritised for planning surveillance programmes and potentially harmful compounds screened for more detailed study, new and pragmatic procedures are required.

In particular research is required into:

- the development of novel prioritisation procedures based on likely modes of metabolism, potential in vivo reactivity and likely degree of exposure;

2. Intakes Estimation

Accurate risk assessment relies on the availability of reliable estimates of intakes of food chemicals. An estimate is based on data on the likely levels and incidences of a chemical in food and upon the rate of consumption of the foods in which that chemical occurs. It is particularly important to base the risk assessment on those who actually consume the food and sometimes these people will comprise a "critical group" such as children, vegetarians etc. In order to improve the accuracy of food chemical risk assessments research is needed to:

- develop databases on the food consumption of critical groups of consumers who might be at greater risk from food chemicals:
- develop and evaluate statistical techniques for defining levels of consumption and intake,

particularly at the upper end of the range measured;

- develop alternative methods for estimating food chemical exposures, such as biological monitoring, which can be used when conventional techniques are not possible and for validation purposes.

3. Risk Management

Risk management is the process whereby the scientific results of risk assessment are applied to develop policy options for the control of food-related risks. Factors in addition to the scientific data need to be taken into account such as the relative costs and benefits of each option and the practicality of taking any particular course of action. It is also important to take account of consumers' perceptions about risks if appropriate risk management solutions which are acceptable to the public are to be developed.

The public's assessments of food-related risks are often found to differ from those determined by scientists which are based upon technical data and scientific inference. Consumers' beliefs about food-related risks are thought to be due, at least in part, to them having different information about hazards and to them introducing different values into their judgements about food-related risks. Thus the relative importance of perceived risks may not correlate with the actual size of the risks and there will be differences in perceptions of the effectiveness of government risk management policies between consumers and experts.

The difference is particularly pronounced in perceptions of the very low level risks associated with food. In the past government advice has tended to imply that all food should be absolutely safe. This has led consumers to believe that food should be free from all risk, ie be associated with 'zero risk'. As our scientific capabilities and our understanding of risk assessment have developed we have come to see that this is an impossible aim, since there must always be some small degree of risk associated with any human activity. There will always come a point where the extra benefit to be gained from reducing the degree of risk one degree further is outweighed by the cost to society of achieving this. There is a need to develop systems for the evaluation of the costs and benefits associated with food risks. Experts therefore aim to achieve the lowest level of risk practicable. Many consumers on the other hand might consider that any degree of risk is unacceptable.

A possible way of reducing the gulf between experts and consumers is to develop systems for the prioritisation and management of risks which take more account of consumers' perceptions. Another approach is to present information to consumers in a way which addresses their concerns and which they can understand. Research is therefore needed to meet the following objectives:

- to evaluate the potential of economic tools such as cost-benefit analysis for risk management;
- to determine the relative strengths of the individual factors which underlie consumers' perceptions of food-related risks and to develop methods for evaluating perceptions of particular risks;

- to better understand the methods which will have to be adopted to communicate information about food-related risks.

It is important to add that the scientific assessment of food-related risks should not be affected by perceptual influences. The object of studying perceptions is to refine the context in which risk assessments are carried out and the ways in which the results are applied.

4.3.2.3 CHEMICAL CONTAMINANTS

B. SHORT TERM R & D

Ministry policy towards food contamination is to keep under review the possibilities of contamination in any part of the national food supply; to ensure that the level of contaminants in food do not reach levels which render the food unsafe and to take the necessary action to maintain a safe food supply.

To meet these requirements an extensive programme of surveillance work is carried out by several Working Parties under the direction of the Steering Group on Chemical Aspects of Food Surveillance supported by a wide ranging programme of research. For ease of consideration, this work can be grouped under the headings; inorganic/organic chemical contaminants, residues of pesticides and veterinary medicines, and contaminants arising from the use of food contact materials.

1. Inorganic and Organic Chemical Contaminants

Work in this area embraces a wide range of potential contaminants from inorganics, such as metals and nitrate and nitrite, to industrial organic chemicals widely dispersed in the environment. Although there is some legislation controlling the inorganic contaminants, the vast majority of chemicals studied under this heading are not subject to any formal control as far as occurrence in the diet is concerned. However, a careful watch is kept on those known, or believed to be, of concern and information gathered about their presence in food is used by MAFF and Department of Health Advisory Committees to determine whether action to protect public health needs to be recommended. This information will also play an important part in EC negotiations for the control of contaminants in food.

Surveillance work is undertaken by the Steering Group Working Parties, covering the principal areas referred to above. This work is supported by a wide range of short-term research. The principal requirements are:

- information on the factors which affect the gut uptake of metals from food; the priority metals for study being aluminium and cadmium;
- information on the exposure of infants and pregnant women to mercury, dioxins and PCBs;
- information on the availability of persistent organics to in crops grown on land treated with sewage sludge;
- identification and quantification of non-volatile N-nitroso compounds especially in fermented foods.

For more specific research and surveillance needs, Food Surveillance Paper No. 31, "Dioxins in Food" and Food Surveillance Paper No. 32, "Nitrates, Nitrites and N-Nitroso Compounds in Food: Second Report" should be consulted. These reports are published by HMSO.

2. Pesticide and Veterinary Medicine Residues

The use of pesticides and veterinary medicines to control pests or diseases in agricultural production may lead to the presence of residues in food as consumed. Legislative control on the use of such chemicals is exercised both at the UK and EC levels. Advice to Ministers in this area is provided by the Advisory Committee on Pesticides (ACP) and the Veterinary Products Committee (VPC). Both committees are responsible for evaluating and approving all new and UK existing products for quality, efficacy and safety before they are allowed to be used.

An important part of the approval procedure is the consideration of residues data relating to the use of the product in question. On the basis of data supplied by the company seeking the approval, and other information, the ACP and VPC are able to establish maximum residue levels or limits (MRLs) respectively. In assessing data from their surveillance programmes on the incidences and concentrations of pesticides and veterinary residues in the food supply, the Steering Group's two Working Parties on pesticides and veterinary residues are primarily concerned with the potential exposure of consumers to residues of these agents. In this respect the fate of residues in the processing of animal and crop products and in the human gastrointestinal tract is of particular importance. Surveillance data also has a valuable role to play in

assessing whether the established MRLs are being exceeded for individual agro-chemicals and their breakdown products. For this work to be successful there is a need to continue the development of analytical methods to measure drug and pesticide residues.

Research to support these requirements is especially needed in the following areas:

- the effects of industrial and domestic food storage, preparation and processing on the residues of carbendazim in apples;
- tracing the sources of pentachlorophenol and other wood treatment agents in animal livers and eggs;
- the development of simple, rapid, high-capacity and low cost analytical techniques (including biosensors and multi-analyte techniques wherever possible) for the reproducible, accurate and interference free measurement of pesticide and veterinary drug residues (in particular trimethoprim) in basic agricultural products (e.g. meat, offal and grain) and foods;
- the nature of physico-chemical binding of veterinary drug residues to cellular constituents and the analytical determination of such bound residues and bioavailability (includes the determination of the fate in the human gastro-intestinal tract of veterinary residues which are covalently bound or otherwise conjugated to macro-molecular inedible animal tissues and products);

Further details of research requirements are indicated in Food Surveillance Paper (FSP) No. 33, "Veterinary Residues in Animal Products 1986-1990".

3. Contaminants Arising from the Use of Food Contact Materials

Contaminants entering food as a result of the use of food contact materials, such as packaging, are controlled in the UK under the Materials and Articles in Contact with Food Regulations 1987. These lay down general rules designed to protect public health but, with the exception of vinyl chloride and mono- and diethylene glycol, do not give specific contaminant limits. Surveillance of the presence of migrating species in the diet in support of these Regulations has been undertaken for a number of years by the Working Party on Chemical Contaminants from Food Contact Materials under the auspices of the Steering Group on Chemical Aspects of Food Surveillance. However, due to a considerable upsurge in EC activity, this area is increasing in importance in terms of data gathering and assessment.

The first of a series of specific EC directives has been agreed and is required to be implemented in UK law in 1993. This lays down rules applying to the use of monomers in plastic materials for food use based on migration limits, and paves the way for optional national approval systems to be put into effect in respect of new substances. Such approvals would apply for a period of 2 years during which EC approval could be sought. Alternatively, EC approval could be sought from the beginning.

Work is also in progress on further directives covering the use of additives and other processing aids in plastics, and chemicals used in other food contact materials. In the meantime work is being undertaken by the Council of Europe in several areas (on inks, paper

and board, coatings, rubber and elastomers) which is expected to provide supporting detail for the EC legislation.

A considerable technical input is required into both EC and Council of Europe negotiations. In addition, existing food contact materials require surveillance, to ensure that their use poses no hazards. In addition new substances require investigating. Work is also required to develop appropriate analytical methods for those monomers on EC positive lists with specific migration limits. This work is being extended to cover plastic additives for future legislative purposes.

To ensure that these various requirements are met, research is required to:

- identify the transformation products from plastics additives, such as antioxidants, during processing;
- identify the major migrants from paper and board used for food contact in the UK into foodstuffs commonly in contact with these materials;
- quantify the migration of monomers and plastics additives from coatings, in particular can lacquers and sealants; paper or cans);
- investigate migration from food contact rubbers and elastomers, in particular structural components and vulcanising agents.

This work will be done in collaboration with the EC and industry.

4.3.2.4 NATURAL CONSTITUENTS OF FOOD

A. STRATEGIC RESEARCH

There are a large number of non-nutrient substances present in the food supply whose impact on key de-activation or activating metabolising systems in the liver and other organs is poorly understood. In the past the emphasis has been almost entirely on those substances which might give rise to long-term toxicity. Whilst this concern remains, and is the subject of considerable research investment by MAFF, almost no work has been undertaken into those factors in the diet, other than the nutrients, which may de-activate metabolic pathways leading to toxicity, or activate key de-toxifying pathways.

Strategic research is required into the further characterisation of factors in the diet which are likely to be protective against long-term degenerative disorders. In particular, research is required into:

- dietary factors affecting the activity of key intra-cellular oxygen free radical de-activating enzyme systems;
- the identification and elucidation of the mechanisms of dietary factors, other than known nutrients, which antagonise the formation of oxygen free radicals formed in-vivo;
- dietary factors which lead to an inactivation of the phase 1 enzyme systems (cytochrome P450 mono-oxygenases and FMN mono-oxygenases);

- dietary factors which influence the biosynthesis of the prostaglandins and eicosanoids.

Foods and herbal products contain a very large number of non-nutritional compounds, many of which are biologically active. Some classes of chemically similar substances have already been shown to be toxic to humans but there remains a large number of classes of compounds about which little or nothing is known of their effects on health. A Working Party set up under the auspices of the Steering Group on Chemical Aspects of Food Surveillance has drawn together available data on those classes of compounds for which there is evidence of toxicity and placed them in one of the following categories:

- i) sufficient information to assess the likelihood of risk to the health of UK consumers;
- ii) specific data gaps to be filled;
- iii) insufficient information.

The strategic research required for classes of compounds which fall into category iii), in particular for alkaloids (including pyrrolizidine alkaloids, glycoalkaloids and others such as sparteine), furanocoumarins (psoralens) and oestrogens is:

- elucidation of metabolic and hormonal effects in humans;
- identification of naturally occurring substances in the diet which may affect the uptake of the compounds in category (iii).

B. SHORT TERM REQUIREMENTS

Within the Natural Constituents of Food R & D Programme, emphasis will initially be placed on those toxic components whose identities are already known. However, in the future there will be a need to identify other natural toxicants in food and to priorities these for research.

1. Surveillance data is required for classes of compounds which fall into category iii) above (Section 4.3.2.4.A).

Requirements are for:

- the development of analytical techniques suitable for surveillance work and their application to the production of data on levels of natural toxicants in foods (with special attention to variations within the plant, differences between crop varieties, response to stress or damage etc. where appropriate) and in biological fluids, particularly urine and blood;
- effects of processing, storage and domestic preparation on levels of these compounds.

2. INHERENT NATURAL TOXICANTS

Consumer protection against toxic compounds inherently present in foods and herbal products is less amenable to legislative controls than the other types of chemicals which occur in the UK diet. For those factors which are judged to pose a risk to UK consumers, there is a requirement to develop methods of reducing and/or controlling concentrations in foods and

herbal products, or otherwise ameliorating their effects.

The principal research requirements are:

- consideration of the effects of conventional plant breeding programmes on levels of toxic minor constituents of the plant;
- development of processes which reduce or eliminate toxic factors;
- development of rapid semi-quantitative biological/biochemical tests to be used in screening foods and herbal products for toxic factors;
- identification of toxicants in those foods and herbal products shown to be toxic through screening and also in foods and herbal products which have been recently introduced into the UK diet or whose consumption is increasing;
- improved methods (more rapid and less costly) for ranking the potential for harm of these toxic factors.

4.3.2.5 ADDITIVES IN FOOD

B. SHORT TERM R & D

MAFF policy is to permit the use within the UK of those food additives for which the food and drink industry can demonstrate a need and which, on the basis of all the toxicological studies available, can be judged not

to present a hazard to health. To meet the needs of this policy it is necessary to gather and appraise information on the use and intakes of additives, their chemical composition and reaction products and technological need. This is done through discussions with the food, drink and chemical industries, through a programme of work carried out by the Working Party on Food Additives, functioning under the auspices of the Steering Group on Chemical Aspects of Food Surveillance, and through a supporting programme of research. The information gathered in this way is assessed by the Food Advisory Committee which advises Ministers whether the use of individual additives should be permitted and, if so, what conditions should apply to their use. It is also used to ensure that UK interests in this area are adequately represented in negotiations in the EC, Council of Europe and other international fora (eg, the Food and Agriculture Organisation and World Health Organisation).

Research requirements are, in order of priority:

- the reactions of preservatives, anti-oxidants and process flavours during food processing, cooking and storage;

4.3.2.6 PATHOGENIC MICRO-ORGANISMS

The Ministry seeks to ensure that food as consumed does not contain pathogenic micro-organisms or their toxins at levels sufficient to cause food poisoning, and that the levels of pathogens in raw materials are as low as practicable. There is clearly a need to assess the implications for the food chain of the potential risks posed by pathogenic micro-organisms and their toxins.

To this end, research proposals in the following areas would be welcome:

A. STRATEGIC RESEARCH

1. Conditions Leading to Growth or Inhibition of Pathogens

The objective of this programme is to identify conditions favourable to the growth of pathogens which may arise as raw materials are processed and pass along the food chain. Information is sought on the following areas of particular interest:

- the effects of temperature, water activity, pH and atmosphere on the growth of pathogens in food;
- the factors needed to ensure the safety of minimally processed foods.

2. Separation and Concentration of Micro-Organisms from Foods

Traditional techniques of isolating micro-organisms from foods (homogenisation, isolation on selective media and finally identification using biochemical or serological tests) are time consuming and labour intensive. Rapid methods of identification have resulted in some improvements but still require often lengthy preliminary steps. Research is required into:

- technologies which allow the selective extraction of pathogens from foods.

This should lead to a major reduction on the time

required for pathogen detection.

3. Hygienic Processing of Food

(See also section 4.4.3.1)

At present MAFF is supporting a number of projects which should greatly assist in the development of cleaner technologies and improved practice for adoption by industry. The work is primarily focused on improving food safety for the benefit of the consumer but there are strong reasons for ensuring that the work is effectively coupled with industrial exploitation if the benefits are to be fully realised. This work is of particular relevance to Hazard Analysis Critical Control Point (HACCP) strategies and will contribute towards the vigorous application of HACCP, which MAFF wishes to encourage to the whole of the food chain.

Proposals in the following areas would be welcome:

- identification of factors affecting cross-contamination during food manufacturing operations, including hygienic design and operation of equipment;
- the efficiency and effects of cleaning or sanitising of environments or equipment in which food is processed;

The objectives listed in Section A may be achieved with industrial collaboration and as part of the Hygienic Food Processing Programme (Section 4.4.3.1).

4. Detection of Pathogenic Micro-organisms and their Toxins in Food

1. There is a continuing need for the development of novel, rapid and improved methods of analysis for the detection of pathogenic micro-organisms and their toxins in food. Such techniques may be applied in support of microbiological surveillance throughout the food chain. Topics of particular interest are:

- rapid methods for the detection of pathogenic micro-organisms or their toxins in foods;
- methods suitable for the screening of pathogenic micro-organisms (specific identification is not necessarily required);
- methods suitable for the specific detection of pathogenic strains of selected food organisms (the priority is not necessarily for very rapid methods, specificity being more important).

4.3.2.7 IMPROVED METHODS OF ANALYSIS - FOOD IRRADIATION

B. SHORT TERM R & D

The Food (Control of Irradiation) Regulations 1990 allow Ministers to license the irradiation of seven broad classes of food and to approve equivalent imports.

The Government is committed to undertake research into detection tests for irradiated food to aid enforcement of the Regulations and to provide assurance to consumers on effective enforcement, particularly in relation to undeclared imports.

Test methods have already been developed for certain foods, a successfully trialed method has been published in the MAFF "Food Analysis" series.

The principle R & D requirements are for:

- the development of analytical methods or the adaptation of existing methods for the detection of a wider range of foods that may be irradiated; principally seafood, fruit and vegetables;
- evaluation of the reproducibility and accuracy of these methods through collaborative trials.

4.3.3 RADIOLOGICAL PROTECTION (MINIM TOPIC PP1:08)

The Ministry's overall objective under this topic is to safeguard food and agriculture in respect of emissions of radioactivity into the terrestrial environment.

MAFF aims to ensure that:

- i. discharges of radioactivity are within authorised limits and are kept as low as is practicable (a statutory duty upon MAFF under the Radioactive Substances Act 1960). This responsibility is shared with Fisheries Divisions who oversee discharges to sea;
- ii. doses of radiation to the public via the food chain are within acceptable limits;
- iii. the necessary scientific information is available to assess the impact of authorised releases;
- iv. the best scientific advice is available on

remedial and protective action in the event of an adventitious release.

- v. efficient and cost effective programmes for monitoring and enforcement are maintained and enhanced.

A wide range of activities is undertaken to achieve the general aims set out above. These include the regular inspection of nuclear installations, the carrying out of a surveillance programme covering the terrestrial environment and the food supply, the modelling and assessment of effects of discharges, participation in national and international meetings, and simulated nuclear emergencies, and the conduct of a comprehensive programme of research in support of these aims.

Authorisation of Radioactive Discharges

Before an authorisation to discharge can be signed by, or on behalf of the Minister, there is a need to be sure that the discharges will not cause any member of the public to receive a dose of radiation in excess of that considered to be acceptable. However, there is only a limited amount of "real" data available on the transfer of these materials through the environment and the food chain as accidents involving excessive release of radioactive materials have been few. The assessment of the likely effect of proposed discharges has therefore to be carried out using suitable predictive models.

4.3.3.1 ADVENTITIOUS RELEASES

No matter how small the chances are, the threat of a nuclear accident is with us all the time. There is a

need to develop remedial measures and protective action to ensure that, in the event of an accident, MAFF is in a position with the best scientific advice to protect the public from exposure to activity from the food chain and to minimise the damage to agriculture.

Research is required to achieve the following objectives:

- i) to improve the understanding of the behaviour of radioactivity in the food-chain;
- ii) to develop methods for ameliorating the effects of any radio-active fall-out;
- iii) to provide the basis for effective response in the event of any adventitious release of radioactivity;

To achieve these objectives, research is required to:

- provide better information on the behaviour of C-14 in the environment and food-chain, including comparison of analytical laboratories, establishment of true background levels, and improvement of models for environmental transfers and calculation of ingestion doses;
- improve our ability to model the potential impact on the food-chain of the proposed NIREX repository for radioactive waste, including critical reviews of NIREX documents, and identification and assessment of areas other than terrestrial agricultural pathways which might be of concern to MAFF;

- improve our capability to model the impact on the food-chain of routine or accidental releases into the environment of in particular S-35, Ru-106 and Pu isotopes and solid particles; to develop dispersion models to provide information in the range 30-100km from the source, and to develop existing models to allow for variation in wind direction; to review the advantages or otherwise of probabilistic modelling; to carry out an intercomparison exercise between MAFF and other models;
- improve our ability to ameliorate the effects of the Chernobyl accident and any future accident, by integration of existing monitoring data into a Geographic Information System, by reviewing in detail the effectiveness of countermeasures carried out in the former Soviet Union, by studies of the uptake of radiocaesium from upland soils by new plants, and by the use of radiotagging to gather detailed information on the grazing behaviour of sheep on the fells;
- improve our ability to monitor radionuclides in the environment and food-chain, by development of more sensitive and/or more economic ways to analyse for radionuclides, in particular C-14, S-35, Ru-103, Ru-106, Pb-210 and Po-210.

4.4 MAFF SUPPORT FOR INNOVATION (MINIM TOPIC CE2:10; AGRICULTURAL COMMODITIES, TRADE AND FOOD SUPPLY DIRECTORATE)

Government policy towards support for innovation and industrial competitiveness is to:

- encourage industry to increase its funding of R & D and to apply new technologies more effectively;
- stimulate more effective and better technology transfer into industry;
- encourage industry to make effective use of its own and academic resources through collaborative R & D, both nationally and internationally;
- stimulate innovation by small firms especially in the adoption of advanced technologies.

MAFF aims to promote a competitive economy by encouraging the development of efficient food and drink manufacturing and distributive industries.

At the present time the UK food and drink industries vary considerably in their level of research investment from multi-national companies with impressive research facilities, to smaller companies whose technical skills are confined to maintaining production and quality control. Given the size of the industry overall, investment in research is low compared with other sectors of manufacturing industry.

The advent of the Single Market is beginning to exert strong competitive pressures on the UK industry. Those companies who are able to increase their competitiveness through improved efficiency, quality and diversity, are likely to be the most successful in responding to increased market opportunity. Technology

can play a significant role in ensuring these goals are met.

4.4.1 Achieving the Aims

MAFF priorities are to provide for science and technology initiatives which are designed to encourage industry to make an even greater commitment to investment in innovative research.

A major policy objective of MAFF is to examine whether the present mechanisms used to stimulate the uptake of technological developments into the food and drink industries are optimal or could be improved. There is a general view that the UK's industrial competitiveness is crucially dependant on developing the correct mechanisms to effectively exploit the strong science base which exists.

In order to investigate the problems which are specific to the industries which MAFF sponsors, the Council for the Exploitation of Science and Technology (CEST), of which MAFF is an Associate Member, has been commissioned to undertake a study into the structural constraints on the uptake of innovation in the food sector. Their report will not be available until the autumn of 1992 but its conclusions will be used to develop MAFF's future policies.

4.4.2 LINK INITIATIVES

Three main mechanisms for stimulating innovation are applied at present. These are:

- LINK initiatives;

- technology transfer initiatives;
- support for training.

4.4.2.1 Food Processing Sciences

In order to strengthen technological innovation in the industry, a £7M LINK Programme in the Food Processing Sciences was announced jointly by MAFF and DTI in 1988. This programme, which is to be supported for five years in the first instance, aims to improve the competitiveness of UK industry through encouraging precompetitive research in the areas of:

- improvements in the safety of food processing;
- predicting the properties of food from a knowledge of its components;
- modelling of processes;
- on-line measurements for improved process control;
- biotechnology applied to food production.

This programme has seen a successful take-up by academic groups and industry. Of the £7M committed initially by Government, supplemented by an extra £3M in 1992, some 78% of these resources have been taken up, and a total of 31 LINK projects are currently underway or in the pipeline and close to approval. It is anticipated that there will be no opportunities to fund extra projects within this programme before it is due to terminate in 1995.

4.4.2.2 Agro-Food Quality

The food industry has an unfulfilled requirement for raw materials which have quality attributes demanded by consumers and which will improve the industrial production of food. In many instances these requirements have been built up pragmatically, with little scientific understanding of the compositional characteristics which contribute to the quality of the final product as consumed.

Biotechnology provides the means of improving the quality and variety of agricultural materials. Major research inputs are concerned with the production of raw materials with improved nutritional composition, reduce demand for chemical inputs through resistance to disease or by nitrogen fixation, as well as improved yield (eg BST). More attention is now being given to improving attributes in raw materials which the food industry has identified as providing benefits in processing, but a large area of ignorance still exists.

Consumer response to quality is also poorly understood. Advances in the science of the psychology of food choice and the quality of foodstuffs is a subtle concept involving a wide range of chemical, physical and behavioural parameters. This concept has to be unravelled into specific quantifiable parameters and matched with the processing and distribution needs of the food and catering industry.

In 1991 MAFF launched the LINK Agro-Food initiative to stimulate industrial interest in precompetitive research on improving agricultural raw material and processed food quality. The overall technical mission is to stimulate:

- improved quantitative measurements of quality;
- understanding of the compositional factors in raw materials which determine processing and eating quality;
- stimulation of biotechnological means of implementing these attributes.
- improving shelf-life and storage quality;
- an improved understanding of the quality parameters which determine food choice.

Examples of projects suitable for support include:

- Structural Studies on Food Raw Materials (eg work to understand the factors governing the behaviour of food raw materials under the stresses of harvesting and processing procedures);
- Definition of Quality Attributes (eg work to establish the biochemical and physiological events relating to eventual eating quality of food materials, and ways of influencing these);
- Storage Phenomena and Quality Retention (eg studies on enzymic mechanisms of food spoilage and methods of inhibiting these);
- Food Acceptability and Choice (eg Improved scientific understanding of the effects of composition and processing variables on flavour release and perception. Development of predictive models linking sensory data with consumer behaviour);

- Biotechnology (eg characterisation at a molecular level of factors conferring nutritional benefit or post-disease resistance and incorporation of these into relevant plant or animal species by genetic manipulation).

At present some £4.2M out of a total Government budget of £8M is committed and invitations are invited from consortia for support.

Individuals with an interest in this programme are asked to discuss their ideas with the LINK Secretariat who will assist proposers in the development of their ideas. Further information on this programme is given in Appendix 5.

4.4.3 NEW PROGRAMMES

Various new collaborative research initiatives are in the planning stage at the present time and will be widely advertised if they are subsequently approved for funding. The three main programmes being considered are:

- i. hygienic food processing;
- ii. rapid and versatile processing;
- iii. innovative food packaging technologies.

4.4.3.1 HYGIENIC FOOD PROCESSING

At present MAFF is supporting a number of projects which should greatly assist in the development of cleaner technologies and improved practice for adoption by industry. The work is primarily focused on improving food safety for the benefit of the consumer, but there are strong reasons for ensuring that the work is effectively coupled with industrial exploitation if

the benefits are to be fully realised.

It is the intention to bring these projects together under a co-ordinated initiative where there will be a core programme of science undertaken probably in liaison with the French Government and Industry Initiative on the "Ultra-Clean Factory". Feeding from this core programme will be a number of satellite projects suitable for funding jointly with industry. The core programme might consist of research in the following areas:

- extending predictive modelling to spoilage organisms;
- further development of detection techniques for microbes, using for example, DNA probe methods;
- improving methods for product, raw materials and air handling.

A Programme Manager will be appointed shortly to take this initiative forward.

4.4.3.2 RAPID AND VERSATILE PROCESSING TECHNOLOGIES

At the present time an industrial consultant is identifying research opportunities in the general area of rapid and versatile processing technologies with particular emphasis on:

- sensor technologies suitable for use in a food processing environment;
- novel process engineering;
- automatic handling and cutting of delicate materials;

- intelligent control techniques and databases;
- process planning, modelling, simulation, control and scheduling.

The interest of industry in developing proposals for research in these areas will be solicited and the overall response used as a basis to seek support for a joint DTI-MAFF LINK programme.

Academics and industrial scientists who are interested in contributing to the development of this programme should contact Dr Steve Beckett, Nestec York PLC, York YO1 1XY. Tel: 0904 612261 Fax: 0904 610730.

4.4.3.3 INNOVATIVE FOOD PACKAGING TECHNOLOGIES

The recent report to the Priorities Board from the Food and Drink Federation, Research Working Party on, "Food Research for the UK", indicated that there was interest on the part of the food industry in developing an initiative in this field.

The possible areas for work which they have identified are:

- i). "intelligent" materials which can give evidence of tamper, contamination or time/temperature exposure in manufacturing and distribution;
- ii). migration of components between packaging and food; and,
- iii). packaging materials and construction that are more environmentally acceptable.

Discussions will shortly be held with representatives from the FDF and the DTI to further develop a suitable programme and consider the best mechanisms for taking this forward.

4.4.4 TECHNOLOGY TRANSFER

The Priorities Board has evaluated the uptake of science and technology by the food industry and has recommended an increased effort to improve technology transfer into the industry.

MAFF already has a responsibility to try to ensure that the results of publicly funded R & D are transferred into industry. The LINK initiatives have assisted this process by bringing industry more directly into project selection and evaluation.

It is also proposed to:

- build in technology transfer initiatives as part of commissioned research;
- improve technical training;
- strengthen the Food Research Association's leadership in technology transfer particularly in relation to the needs of small manufacturing enterprises (SMEs).

4.4.4.1 SUPPORT FOR TRAINING

There is a general belief that one of the most effective ways of improving technical innovation in the

food industry is to encourage good quality graduates in science and technology to enter the food industry.

At the present time MAFF supports:

- graduate training through the commissioning of individual research proposals with Higher Educational Institutions (HEIs) under the MAFF Open Contracting Scheme;
- MAFF Studentships in food science;
- The Teaching Company Scheme. MAFF has provided substantial resources to the Science and Engineering Research Council's Teaching Company Directorate to increase the scope of this scheme to cover the needs of the Food and Drink Manufacturing and Distribution Industries. Some £0.25M is expected to be available for 1993/94. Further information about the scheme, and how to apply for Associateships, can be obtained from the SERC Teaching Company Directorate (Sudbury House, London Road, Faringdon, Oxon, SN7 8AA - Tel: 0367 242822).

4.4.5. EUREKA

This European-wide programme focusing on facilitating industrial collaboration and co-operation provides a mechanism for creating new market opportunities throughout Europe. It is ideally suited for extending the marketing and technical skills of SME's and the UK Government is committed to increasing the awareness of UK industry to the opportunities presented by EUREKA. Both the French and Spanish EUREKA offices are assisting in the development of specific initiatives in

the agri-food sector, and MAFF and DTI are closely involved. The DTI has appointed Dr Brian Kersop of Biostrategy, 10 Waterside, Ely, Cambridgeshire, CB7 4AZ, Tel: 0353 663562, Fax: 0353 663436 to promote EUREKA initiatives in the biosciences and agro-food sectors. Companies interested in the possibilities afforded by EUREKA should contact him or the DTI/EUREKA office (details in Appendix 8).

MAFF has commissioned all three food Research Associations to investigate interest in EUREKA amongst their membership in the specific sectors where their technical and industrial skill base is focused.

TABLE 1

MINIM: PP1:06 FOOD QUALITY AND NUTRITION

PROGRAMME	PROGRAMME MANAGER
1. Antioxidants in Foods	Dr Richardson
2. Role of Dietary Lipids in Influencing Adverse Physico-chemical Response	Dr Stanley
3. Food Authenticity and Adulteration	Mr Dale
4. Functional Effects of Micro-nutrients	Dr Stanley
5. Role of Complex Carbohydrates in the Diet	Professor Conning
6. Food Structure in Support of Nutritional Goals	Professor Conning
7. Dietary Surveys and Food Composition Studies	Dr Buss
8. Improved Methods of Analysis	Dr Wood
9. Food Acceptability and Choice	
10. Diet and Cell Proliferation (New)	

TABLE 1 (Contd)

MINIM: PP1:07 FOOD SAFETY

PROGRAMME	PROGRAMME MANAGER
Chemical Food Safety	
1. Chemical Contaminants from Food Production	Dr Burt
2. Chemical Contaminants from Food Contact Materials	Dr Burt
3. Natural Constituents of Food	Dr Burt
4. Risk Assessment	Dr Fisher
5. Food Irradiation	Dr Segal
6. Improved Enforcement Methods of Food Analysis	Dr Wood
7. Food Toxicology	Dr Fisher
8. Food Additives	Dr Fisher
9. Food Prosamo (New)	
Microbiological Food Safety	
1. Predictive Modelling of Growth of Micro-Organisms	Professor Holding
2. Pathogens in Foods and Food Handling Environments	Dr McGrath
3. Separation and Concentration of Pathogenic Micro-Organisms from Food	Dr Easter
4. Detection of Pathogens and their Toxins	Dr McGrath
5. Growth Conditions for Pathogens	Dr Harding
6. The Physico-chemical Principles Underlying Microbial Growth in Heterogenous Foods	Professor Leslie
7. Physiology of Emerging Food Borne Pathogens	Dr Harding

TABLE 1 (Contd)

MINIM: PP1:08 RADIOLOGICAL PROTECTION

PROGRAMME	PROGRAMME MANAGER
1. Environmental Radioactivity Research in Support of Surveillance	Dr Segal
2. Assessment of Effects of Radioactive Discharge	Dr Segal
3. Response to Emergencies	Dr Segal
MINIM: CE2:10 Food and Drink Manufacturing and Distribution Industries	
1. LINK - Food Processing Sciences	Dr Goodacre
2. LINK - Agro-Food Quality	Dr Goodacre
3. Technology Transfer and Other Schemes	
4. Industrial Innovation Schemes (New)	

**MINISTRY OF AGRICULTURE, FISHERIES AND FOOD
OPEN CONTRACTING SCHEME (FOOD) 1992/1994**

PROJECT APPLICATION FORM

1. Applicant(s)	Applicant 1	Applicant 2	Applicant 3
Surname			
Forename(s)			
Age			
Title			
Post held			

2. Institution/ Authority (administering grant if approved) Department accommodating project (and institution if other than opposite)

City or Town

3. Title of project

4. Abstract of research

5. PROPOSED STARTING DATE:

PROPOSED DURATION (months):

6. PROJECT LEADER:

7. SUMMARY OF TOTAL ESTIMATED COSTS

This should include the costs of any of the research work which will be funded by industry or bodies other than MAFF. Please indicate the percentage of the total cost for which you are requesting MAFF funding.

Year 1 £	Year 2 £	Year 3 £	TOTAL £

Percentage of total estimated cost required from MAFF

MAFF USE ONLY

Project code

Project Officer

CSA File Reference

Referee

Class

--	--	--	--	--	--	--	--	--

8. (a) Is your related research currently being supported by an outside body?
If yes, please indicate the topic, supporting organisation, value and tenure.
- (b) Are you currently applying elsewhere for support for work relating to the present proposal?
If yes, please give details as for 8(a).
- (c) Is this application currently being submitted elsewhere?
If yes, to which organisation; and by what date is a decision expected?
- (d) Has this application been submitted elsewhere over the past year?
If yes, to which organisation and what was the result?
- (e) Indicate any academic or industrial laboratory with whom you intend to collaborate in this research proposal.
- (f) Is the proposed research likely to lead to patentable or otherwise commercially exploitable results?
If yes, please give brief details.

9. Full official postal address of project leader Telephone number of applicant
(please give STD code from London and extension)

FAX:

10. Signature of project leader: Date:

-
11. This application should be submitted by/through (i) the Head of Department and (ii) the officer who will be responsible for administering any grant that may be awarded. Each should sign the following declaration:

I confirm that I have read this application and that, if granted, the work will be accommodated and administered in the Department/Institution in accordance with MAFF's contractual arrangements. The staff gradings and salaries quoted are correct and in accordance with the normal practice of this Institution.

(i) Signature of Head of Department

(ii) Signature of Administrative Authority

Title

Finance Officer/Bursar/Registrar/Secretary of
Institution (delete as appropriate)

To be appended in typescript or block capitals

To be appended in typescript or block capitals

Name and initials (of (i) above)

Name and initials (of (ii) above)

Institution

Institution

Address (if different from 10 above)

Address and telephone number
(including STD code from London and extension)

Date:

Date:

-
12. Name, address and telephone number (including STD code from London and extension) in typescript (or block capitals) of the officer who should be contacted regarding the administration of the grant if awarded, if different from (ii) above:
-

13. INTERMEDIATE OBJECTIVES (Scientific and technical)

14. FINAL OBJECTIVES

15. KEY MEASURES OF ACHIEVEMENT
(Performance targets and target dates for achievement)

16. SUMMARY OF STAFF EFFORT REQUIRED FOR MAFF COMPONENT OF THE WORK (Show the total person-years (to first decimal place) expected to be spent on the project by each of the staff involved, including both scientists and assistants).

17. ESTIMATE TOTAL COSTS - DETAIL

Before completing this section you should read carefully the enclosed Guidance Notes "Project Cost Estimates", which explain what project costs the Ministry is prepared to fund.

PROJECT COSTS : £ thousands

	Year 1 £	Year 2 £	Year 3 £	Total £
Pay costs (see note a)				
Salary				
National Insurance				
Superannuation				
Total:				
Consumables (specify) (see note b)				
Capital equipment (see note c)				
Travel Expenses (see note d)				
Overheads (see note e)				
Consultancy, sub contracts (see note f)				
Other costs (see note g)				

TOTAL PROJECT COSTS

--	--	--	--	--

18. Estimated Support from Bodies other than MAFF

Give estimates of any support from industry or other bodies which you believe will be forthcoming.

£ thousands

	1
YEAR	2
	3

Will there be any support in kind? If so give brief details.

PROPOSED INVESTIGATION

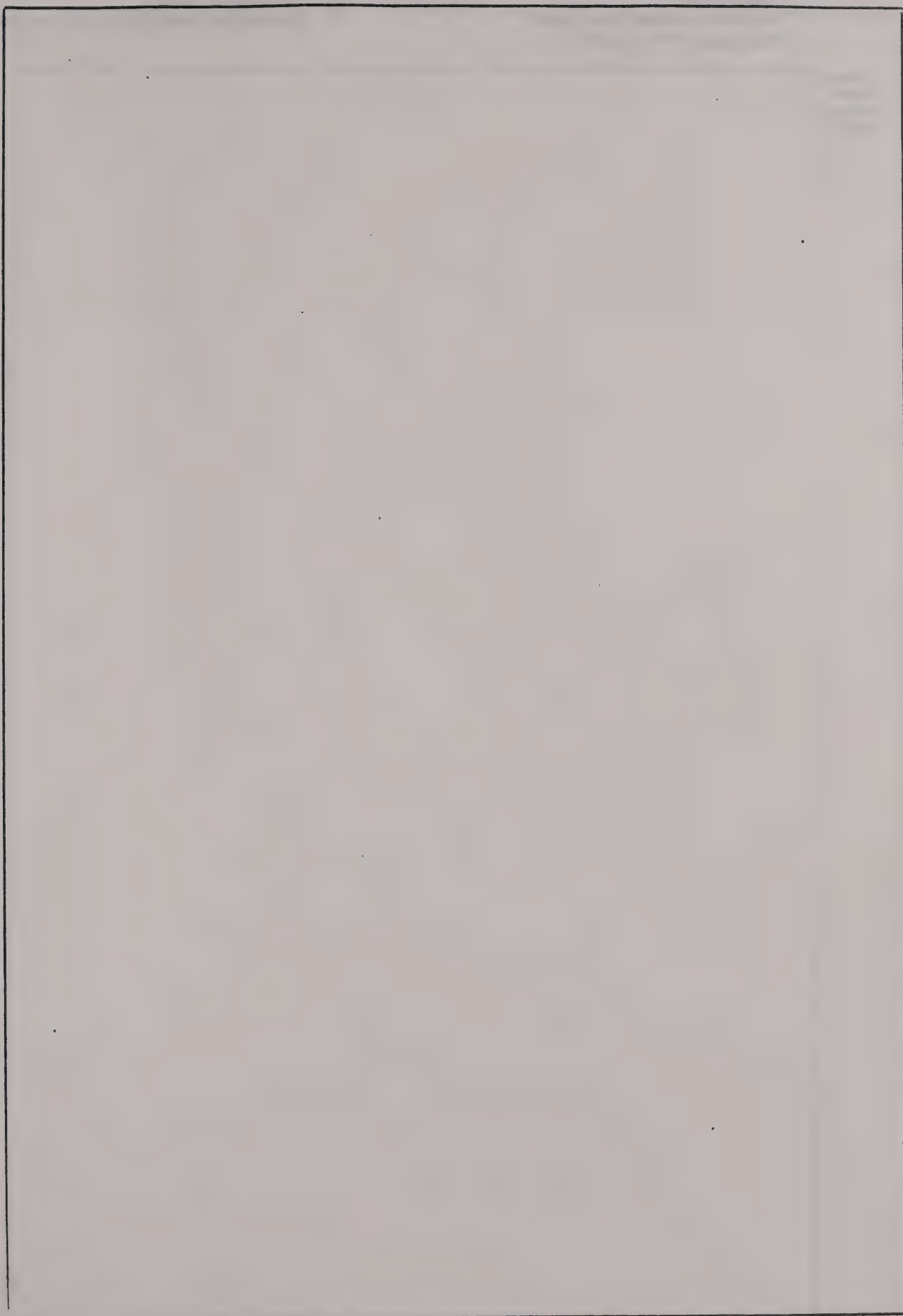
1. Title of project
2. Purpose of proposed investigation
3. Background of the project
4. Plan of investigation
5. Detailed justification for support requested

Please
leave
margins
blank

PROPOSED INVESTIGATION

1. Title of project
2. Purpose of proposed investigation
3. Background of the project
4. Plan of investigation
5. Detailed justification for support requested

Please
leave
margins
blank



PROPOSED INVESTIGATION

1. Title of project
2. Purpose of proposed investigation
3. Background of the project
4. Plan of investigation
5. Detailed justification for support requested

Please
leave
margins
blank

TABLE 1. Summary of the results of the 1998 survey of the distribution of the 10 most common species of the genus <i>Phragmites</i> in the coastal marshes of the Sacramento-San Joaquin River Delta, California.	
Species	Number of sites where species was found
<i>Phragmites australis</i>	10
<i>Phragmites communis</i>	10
<i>Phragmites pectinatus</i>	10
<i>Phragmites terrestris</i>	10
<i>Phragmites communis</i>	10
<i>Phragmites australis</i>	10
<i>Phragmites communis</i>	10
<i>Phragmites pectinatus</i>	10
<i>Phragmites terrestris</i>	10
<i>Phragmites communis</i>	10

PROPOSED INVESTIGATION

1. Title of project
2. Purpose of proposed investigation
3. Background of the project
4. Plan of investigation
5. Detailed justification for support requested

Please
leave
margins
blank

CURRICULUM VITAE OF APPLICANT

1. Surname	Forename(s)	Age d.o.b
2. Degrees, etc. (subject, class, university, and date)		
3. Posts held (with dates). Where personal support is requested please identify tenure and source of funding of present post.		
4. Recent publications, also papers in press		

CURRICULUM VITAE OF PROPOSED RESEARCH STAFF

1. Surname	Forename(s)	Age d.o.b
2. Degrees, etc. (subject, class, university, and date)		
3. Posts held (with dates); please identify tenure and source of funding of present post		
4. Recent publications (title and reference)		
1. Surname	Forename(s)	Age d.o.b
2. Degrees, etc. (subject, class, university, and date)		
3. Posts held (with dates); please identify tenure and source of funding of present post		
4. Recent publications (title and reference)		

APPENDIX 2

DEFINITION OF GENETICALLY MANIPULATED ORGANISMS TAKEN FROM OFFICIAL JOURNAL OF THE EUROPEAN COMMUNITIES (No.L 117/16; 8.5.90)

For the purposes of this Directive (90/220):

1. 'organism' is any biological entity capable of replication or of transferring genetic material;
2. 'genetically modified organism (GMO)' means an organism in which the genetic material has been altered in a way that does not occur naturally by mating and/or natural recombination.

Within the terms of this definition:

- i. genetic modification occurs at least through the use of the techniques listed in Annex 1 A Part 1;
 - ii. the techniques listed in Annex 1 A Part 2 are not considered to result in genetic modification.
3. 'deliberate release' means any intentional introduction into the environment of GMO or a combination of GMOs without provisions for containment such as physical barriers or a combination of physical barriers together with chemical and/or biological barriers used to limit their contact with the general population and the environment;
 4. 'product' means a preparation consisting of, or containing, a GMO or a combination of GMOs, which is placed on the market;
 5. 'placing on the market' means supplying or making available to third parties;
 6. 'notification' means the presentation of documents containing the requisite information to the competent authority of a Member State. The person making the presentation shall be referred to as 'the notifier';
 7. 'use' means the deliberate release of a product which has been placed on the market. The persons carrying out this use will be referred to as 'users';
 8. 'environmental risk assessment' means the evaluation of the risk to human health and the environment (which includes plants and animals) connected with the release of GMOs or products containing GMOs.

ARTICLE 3

The Directive shall not apply to organisms obtained through the techniques of genetic modification listed in Annex 1 B.

TECHNIQUES REFERRED TO IN ARTICLE 2(2)

PART 1

Techniques of genetic modification referred to in Article 2(2)(i) are inter alia:

1. recombinant DNA techniques using vector systems as previously covered by Council Recommendation 82/427/EEC⁽¹⁾;
2. techniques involving the direct introduction into an organism of heritable material prepared outside the organism including micro-injection, macro-injection and micro-encapsulation;
3. cell fusion (including protoplast fusion) or hybridization techniques where live cells with new combinations of heritable genetic material are formed through the fusion of two or more cells by means of methods that do not occur naturally.

PART 2

Techniques referred to in Article 2(2)(ii) which are not considered to result in genetic modification, on condition that they do not involve the use of recombinant DNA molecules or GMOs, are:

1. in vitro fertilization;
2. conjugation, transduction, transformation or any other natural process;
3. polyploidy induction.

ANNEX 1 B

TECHNIQUES REFERRED TO IN ARTICLE 3

Techniques of genetic modification to be excluded from this Directive, on condition that they do not involve the use of GMOs as recipient or parental organisms, are:

1. mutagenesis;
2. cell fusion (including protoplast fusion) of plant cells where the resulting organisms can also be produced by traditional breeding methods.

(1) OJ No. L213, 21.7.82, p.15

ANTIOXIDANTS IN FOODS

PROGRAMME MANAGER

Dr D Richardson, Nestle Company Plc

OBJECTIVES

- To provide an improved scientific basis on which to base recommended dietary intakes for the lipid and water soluble antioxidant nutrients.
- To provide a better scientific understanding of the role of antioxidants in free radical mediated cellular damage.

The programme will start in September 1991 and will run for 3 years at a cost of £1.65M.

PRINCIPAL CONTRACTORS 1991/92

Mechanisms of Lipid Oxidation by Macrophages

Dr M J Mitchinson, University of Cambridge

Impaired Endothelial Cell Function in Response to Oxidative Stress: Relevance to the Pathogenesis of Atherosclerosis

Dr G E Mann, Kings College London

Antioxidants in Food Preservation: Evaluation of Natural and Synthetic Compounds by Biologically Relevant Assays

Professor Halliwell, Kings College London

Modification of Antioxidant Status and Indices of Free Radical Mediated Damage in Relation to Cancer and Heart Disease

Dr A Collins, Rowett Research Institute

Prospective Markers of Antioxidant Status in Relation to Future Cardiovascular Disease, Lung and Stomach Cancer

Dr D Thurnham, Dunn Nutrition Centre

Vitamin E and Vitamin C in the Protection of Cells against Oxidative Damage

Dr K Cheeseman, Brunel University

The Effects of Dietary Vitamin Supplementation on Oxidative LDL Damage in Disease

Dr H Griffiths, Wolfson Research Laboratory, University of Birmingham

The Role of Dietary Components in the Pathogenesis of Inflammatory Joint Disease: A High Field NMR Study

Dr M Grootveld, London Hospital Medical College

RAPID METHODS FOR THE DETECTION OF FOOD PATHOGENS

PROGRAMME MANAGER Dr M Easter
 Grand Metropolitan Foods (Europe) Ltd

OBJECTIVE

- To improve the efficiency of analysis of food pathogenic micro-organisms with particular emphasis on improved methods for the isolation of micro-organisms from food substrates or through the application or pre-enrichment phase.

PRINCIPAL CONTRACTORS 1991/92

AFRC Institute of Food Research

Development and Investigation of Novel Methods to Separate and Concentrate Micro-Organisms from Foods to Enhance Rapid Microbiological Methods.

Flow Immuno-fluorescence Cytometry for Separation and Concentration of Food Borne Pathogens.

Development of Gene Probes for the Rapid Detection of Yersinia and Aeromonas.

Separation and Isolation of Bacterial Nucleic Acids from Foods.

Leatherhead Food Research Association

Separation: An Important Aid to Rapid Microbiological Analysis.

Detection/Quantification of Micro-organisms by Novel Lectin Based Assays.

Enzyme Linked Immunological Biosensors for the Specific Detection of Pathogenic Bacteria in Foods.

Campden Food and Drink Research Association

An Investigation into the Use of Biosorbants for the Separations and Concentration of Low Levels of Pathogens.

University of Aberdeen

Use of Monoclonal Antibody Fragments to Quantitatively Remove Micro-organisms from Food.

ROLE OF COMPLEX CARBOHYDRATES IN NUTRITIONAL HEALTH

PROGRAMME MANAGER Professor D M Conning
British Nutrition Foundation

OBJECTIVES

- To provide an improved scientific basis on which to derive recommended dietary intakes for specific types of "fibre" (including non starch polysaccharide and resistant starch) according to the following physiological parameters:
 - cholesterol lowering activity;
 - effects on constipation;
 - effects on prolonging blood glucose release;
 - effects on reduction of the concentration of known faecal genotoxins in the lower bowel;
- To ensure reproducible and reliable methodology is available on which "fibre" claims can be based in relation to the specific physiological effects which are produced.

PRINCIPAL CONTRACTORS 1991/92

Energy Value and Metabolism of Complex Carbohydrates
AFRC Institute of Food Research

The Development and Use of Methods to Identify the Various
Actions of Dietary Complex Carbohydrates
University of Edinburgh

The Physiological Responses to Dietary Starch Especially that in
Cereal Based Foods
FMBRA and University of Surrey.

Relationship of Physicochemical Structure of Starch and
Digestibility in the Lower Gut
University of Nottingham

The Control of Starch Digestion in Man, and Its Implications for
Health
Dunn Nutrition Centre

LINK PROGRAMME IN THE FOOD PROCESSING SCIENCES

PROGRAMME MANAGER Dr Christina Goodacre
Biotechnology Unit
Laboratory of the Government Chemist
Queens Road
Teddington
Middlesex
TW11 0LY

Tel: 081 943 7346
Fax: 081 943 2767

This LINK Programme, which started in September 1988, aims to encourage collaborative R & D that will strengthen the industry's technical base in bioscience, and encourage strategic developments in new processes, biotechnology, food safety, and process modelling and control.

The programme is sponsored jointly by MAFF and DTI. Government funding of £7M is available over 5 years providing that equivalent contributions for collaborative projects are made by industrial partners.

Research will be concentrated upon:

- predicting the structural, functional and textural properties of food from a knowledge of the nature and interactions of its components. Specific targets include the state of water in food systems, the effect of solutes, interfacial phenomena and macromolecular conformation;
- investigating and establishing predictive models for the behaviour of complex food materials during key processing steps;
- establishing principles for the on-line measurement of moisture, appearance and structure, and for rapid detection of micro-organisms and foreign bodies which could form the base for future innovations in process control;
- exploring the use of modern biotechnology in food processing, focusing upon the genetics of food micro-organisms (starter cultures, flavour strains) and enzyme technology;
- food safety.

LINK PROGRAMME IN AGRO-FOOD QUALITY

PROGRAMME MANAGER Dr Christina Goodacre
Biotechnology Unit
Laboratory of the Government Chemist
Queens Road
Teddington
Middlesex
TW11 0LY

Tel: 081 943 7346
Fax: 081 943 2767

This LINK Programme, started in December 1990, aims to encourage collaborative R & D to provide the foundations for improved food quality and, in particular, will stimulate research leading to improvements in the consistency of food raw materials. It also seeks to increase awareness of factors relating to nutrition and food acceptability.

The programme is sponsored by MAFF, DTI and AFRC, with £8M Government funding being made available over 5 years providing that equivalent contributions for collaborative projects are made by industrial partners.

Research will concentrate on:

- identification of features of food raw materials which determine the qualities required by the processor and consumer;
- establishment of strategies for the enhancement of these features at the primary production level necessary to effect improvements in food quality attributes;
- improvement in the nutritional properties of food as eaten;
- improvement in the measurement and understanding of the physical and psychological parameters of food acceptability and choice.

EUREKA

CONTACT POINTS:

UK EUREKA Office
 Department of Trade and Industry
 Research and Technology Policy Division
 Room 204
 Ashdown House
 123 Victoria Street
 London SW1 6RB
 Tel: 071 215 6612
 Fax: 071 821 1298

Dr M T Doel
 Ministry of Agriculture, Fisheries and Food
 Chief Scientists' Group (Food)
 Room G23
 Nobel House
 17 Smith Square
 London SW1P 3JR
 Tel: 071 238 5996
 Fax: 071 238 6591

The EUREKA Programme aims to increase the productivity and competitiveness of European Industry in the world market. It provides a mechanism for fostering pan-European collaboration and provides participating organisations with an opportunity to take part in R & D leading to high technology products, processes or services with partners in one or more of the following countries:

Austria	Iceland	Sweden
Belgium	Rep of Ireland	Switzerland
Denmark	Italy	Spain
Finland	Luxembourg	Turkey
France	Netherlands	
Germany	Norway	
Greece	Portugal	

EUREKA covers civil R & D in all technological fields, amongst which the agro-food sector is identified as a priority area. It is a mechanism for granting high status to R & D projects of quality involving international collaboration. It is not necessarily a mechanism for public funding of R & D and the granting of EUREKA status does not

APPENDIX 8

guarantee full Government funding, however, in appropriate cases member governments can provide financial support to their own participants from their national schemes. EUREKA provides the significant benefits of shared costs and technical resources, attainment of a critical mass to enable really significant technical advances to be made, improved contacts on an international level, greater recognition (particularly important for small companies) etc. It also offers help with finding partners by circulating proposals through the EUREKA network and the promise of supportive measures from EUREKA governments and the EC Commission to break down likely barriers to a project's commercial success.





Ministry of Agriculture, Fisheries and Food
© Crown Copyright 1992